2N6765, 2N6766

File Number **1591**

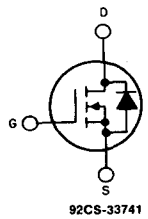
Power MOS Field-Effect Transistors

N-Channel Enhancement-Mode Power Field-Effect Transistors

25 A and 30 A, 150 V and 200 V
$r_{DS(on)}$ = 0.085 Ω and 0.12 Ω

Features:
- *SOA is power-dissipation limited*
- *Nanosecond switching speeds*
- *Linear transfer characteristics*
- *High input impedance*
- *Majority carrier device*

N-CHANNEL ENHANCEMENT MODE



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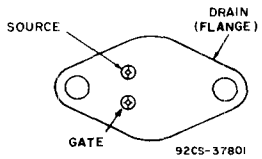
TERMINAL DIAGRAM

TERMINAL DESIGNATION



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JEDEC TO-204AE

The 2N6765 and 2N6766 are n-channel enhancement-mode silicon-gate power field-effect transistors designed for applications such as switching regulators, switching converters, motor drivers, relay drivers, and drivers for high-power bipolar switching transistors requiring high speed and low gate-drive power. These types can be operated directly from integrated circuits.

The 2N6765 and 2N6766 are supplied in the JEDEC TO-204AE steel package.

Absolute Maximum Ratings

	Parameter	2N6765	2N6766	Units
V_{DS}	Drain – Source Voltage	150*	200*	V
V_{DGR}	Drain – Gate Voltage (R_{GS} = 1 MΩ)	150*	200*	V
I_D @ T_C = 25°C	Continuous Drain Current	25*	30*	A
I_D @ T_C = 100°C	Continuous Drain Current	16*	19*	A
I_{DM}	Pulsed Drain Current	50	60	A
V_{GS}	Gate – Source Voltage	±20*		V
P_D @ T_C = 25°C	Max. Power Dissipation	150* (See Fig. 11)		W
P_D @ T_C = 100°C	Max. Power Dissipation	60* (See Fig. 11)		W
	Linear Derating Factor	1.2* (See Fig. 11)		W/°C
I_{LM}	Inductive Current, Clamped	(See Fig. 1 and 2) L = 100 μH		A
		50	60	
T_J T_{stg}	Operating and Storage Temperature Range	-55* to 150*		°C
	Lead Temperature	300* (0.063 in. (1.6mm) from case for 10s)		°C

Electrical Characteristics @ T_C = 25°C (Unless Otherside Specified)

Parameter		Type	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain – Source Breakdown Voltage	2N6765	150	–	–	V	V_{GS} = 0
		2N6766	200	–	–	V	I_D = 1.0 mA
$V_{GS(th)}$	Gate Threshold Voltage	ALL	2.0*	–	4.0*	V	V_{DS} = V_{GS}, I_D = 1 mA
I_{GSSF}	Gate – Body Leakage Forward	ALL	–	–	100*	nA	V_{GS} = 20V
I_{GSSR}	Gate – Body Leakage Reverse	ALL	–	–	100*	nA	V_{GS} = -20V
I_{DSS}	Zero Gate Voltage Drain Current	ALL	–	0.1	1.0*	mA	V_{DS} = Max. Rating, V_{GS} = 0
			–	0.2	4.0*	mA	V_{DS} = Max. Rating, V_{GS} = 0, T_C = 125°C
$V_{DS(on)}$	Static Drain-Source On-State Voltage ①	2N6765	–	–	3.0*	V	V_{GS} = 10V, I_D = 25A
		2N6766	–	–	2.7*	V	V_{GS} = 10V, I_D = 30A
$R_{DS(on)}$	Static Drain-Source On-State Resistance ①	2N6765	–	0.09	0.12*	Ω	V_{GS} = 10V, I_D = 16A
		2N6766	–	0.07	0.085*	Ω	V_{GS} = 10V, I_D = 19A
$R_{DS(on)}$	Static Drain-Source On-State Resistance ①	2N6765	–	–	0.216*	Ω	V_{GS} = 10V, I_D = 16A, T_C = 125°C
		2N6766	–	–	0.153*	Ω	V_{GS} = 10V, I_D = 19A, T_C = 125°C
g_{fs}	Forward Transconductance ①	ALL	9.0*	15.5	27*	S (℧)	V_{DS} = 15V, I_D = 19A
C_{iss}	Input Capacitance	ALL	1000*	2000	3000*	pF	V_{GS} = 0, V_{DS} = 25V, f = 1.0 MHz See Fig. 10
C_{oss}	Output Capacitance	ALL	450*	800	1200*	pF	
C_{rss}	Reverse Transfer Capacitance	ALL	150*	300	500*	pF	
$t_{d(on)}$	Turn-On Delay Time	ALL	–	–	35*	ns	$V_{DD} \cong$ 95V, I_D = 19A, Z_o = 4.7Ω
t_r	Rise Time	ALL	–	–	100*	ns	(See Figs. 13 and 14)
$t_{d(off)}$	Turn-Off Delay Time	ALL	–	–	125*	ns	(MOSFET switching times are essentially
t_f	Fall Time	ALL	–	–	100*	ns	independent of operating temperature.)

Thermal Resistance

R_{thJC}	Junction-to-Case	ALL	–	–	0.83*	°C/W	
R_{thCS}	Case-to-Sink	ALL	–	0.1	–	°C/W	Mounting surface flat, smooth, and greased.
R_{thJA}	Junction-to-Ambient	ALL	–	–	30	°C/W	Typical socket mount

Body-Drain Diode Ratings and Characteristics

I_S	Continuous Source Current (Body Diode)	2N6765	–	–	25*	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier. 
		2N6766	–	–	30*		
I_{SM}	Pulsed Source Current (Body Diode)	2N6765	–	–	50	A	
		2N6766	–	–	60		
V_{SD}	Diode Forward Voltage ①	2N6765	0.85*	–	1.7*	V	T_C = 25°C, I_S = 25A, V_{GS} = 0
		2N6766	0.9*	–	1.8*	V	T_C = 25°C, I_S = 30A, V_{GS} = 0
t_{rr}	Reverse Recovery Time	ALL	–	500	–	ns	T_J = 150°C, I_F = I_{SM}, dI_F/dt = 100 A/μs
Q_{RR}	Reverse Recovered Charge	ALL	–	10	–	μC	T_J = 150°C, I_F = I_{SM}, dI_F/dt = 100 A/μs

*JEDEC registered values. ① Pulse Test: Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%

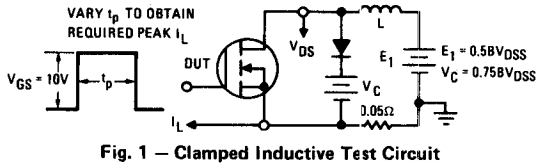

Fig. 1 – Clamped Inductive Test Circuit

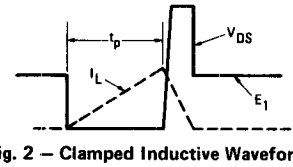

Fig. 2 – Clamped Inductive Waveforms

2N6765, 2N6766

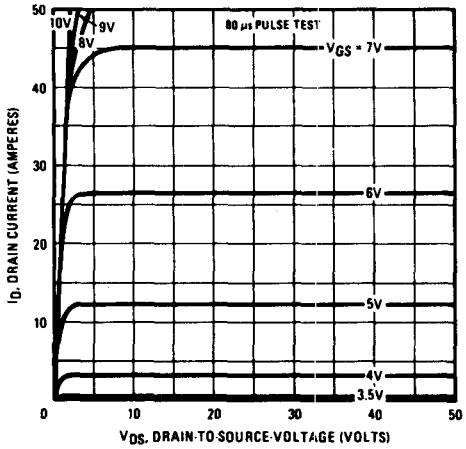

Fig. 3 — Typical Output Characteristics

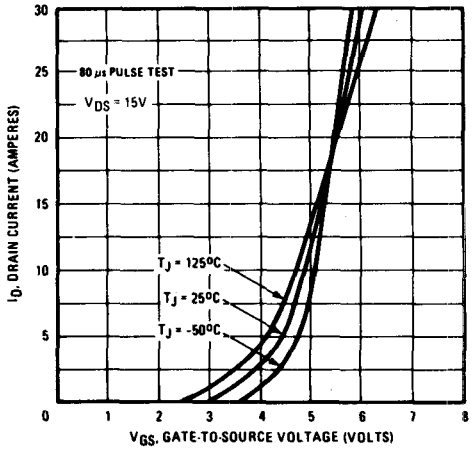

Fig. 4 — Typical Transfer Characteristics

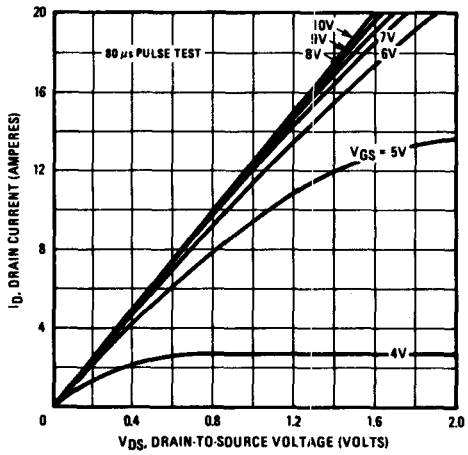

Fig. 5— Typical Saturation Characteristics (2N6765)

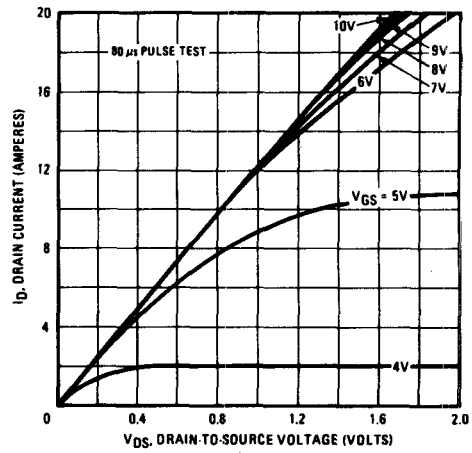

Fig. 6— Typical Saturation Characteristics (2N6766)

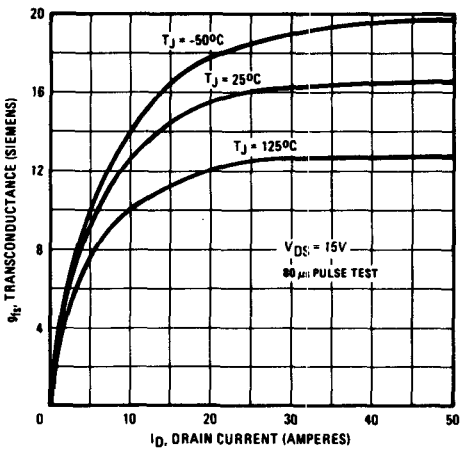

Fig. 7 — Typical Transconductance Vs. Drain Current

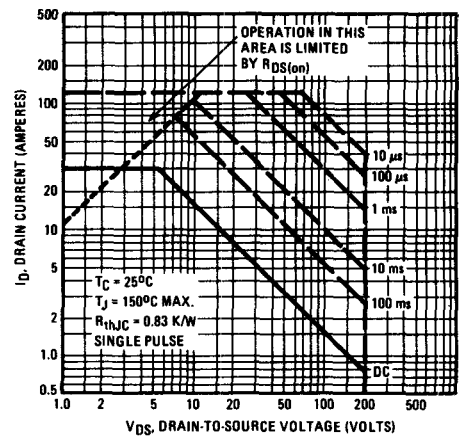

Fig. 8 — Maximum Safe Operating Area

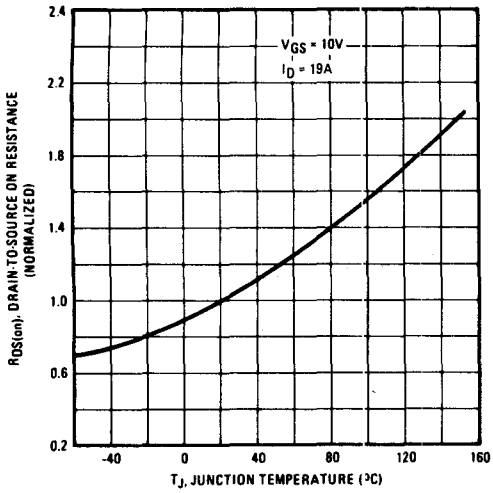

Fig. 9 — Normalized Typical On-Resistance Vs. Temperature

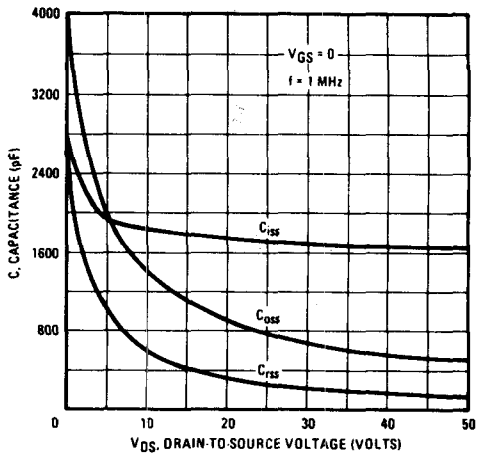

Fig. 10 — Typical Capacitance Vs. Drain-to-Source Voltage

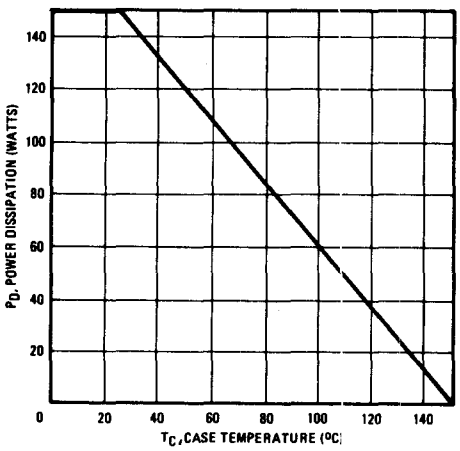

Fig. 11 — Power Vs. Temperature Derating Curve

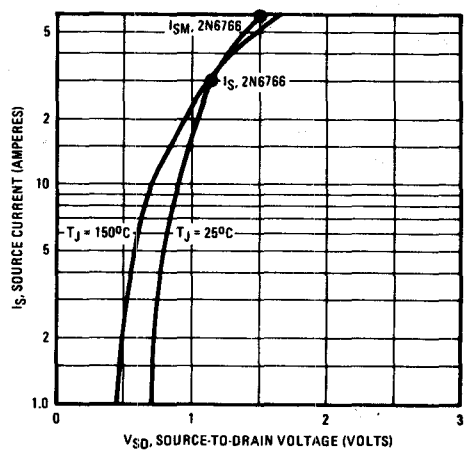

Fig. 12 — Typical Body-Drain Diode Forward Voltage

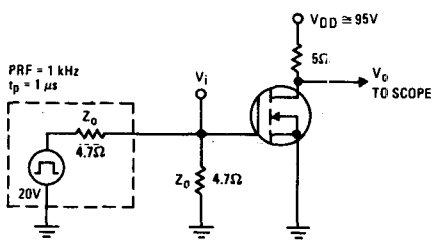

Fig. 13 — Switching Time Test Circuit

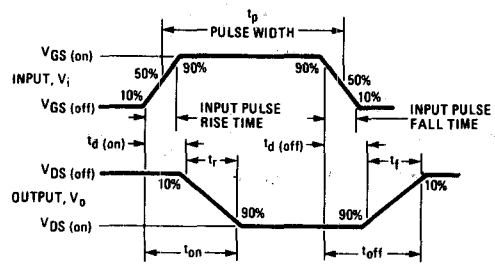

Fig. 14 — Switching Time Waveforms

JAN, JANTX, and JANTXV

JAN, JANTX, and JANTXV Solid-State Power Devices

The major military specification used for the procurement of standard solid-state devices by the military is MIL-S-19500, which covers the devices such as discrete transistors, thyristors, and diodes.

MIL-S-19500 is the specification for the familiar "JAN" type solid state devices. Detailed electrical specifications are prepared as needed by the three military services and coordinated by the Defense Electronic Supply Center (DESC).

Levels of reliability are defined by MIL-S-19500. JAN types receive Group A, Group B, and Group C lot sampling only, and are the least expensive. JANTX types receive 100 percent process conditioning, and power conditioning, and are subjected to lot rejection based on delta parameter criteria in addition to Group A, Group B, and Group C lot sampling. JANTXV types are subjected to 100 percent (JTXV) internal visual inspection in addition to all of the JANTX tests in accordance with MIL-STD-750 test methods and MIL-S-19500.

DESC publishes "QPL-19500", a Qualified Products List of all types and suppliers approved to produce and brand devices in accordance with MIL-S-19500.

The following tables list approved "QPL" types and types that are process of testing preliminary to QPL approval by DESC, respectively.

Custom high-reliability selections of Harris Power MOSFETs can also be supplied with similar process and power conditioning tests and delta criteria.

QPL Approved Types

Harris is presently qualified on the following devices. Prices and delivery quotations may be obtained from your local sales representative.

JAN and JANTX Power MOSFETs

N-Channel Types	MIL-S-19500/	Package	Channel	P_T (W)	I_D (A)	BV_{DSS} (V)	r_{DS} (on) Ω
2N6756	542	TO-204AA	N	75	14	100	0.18
2N6758	542	TO-204AA	N	75	9	200	0.4
2N6760	542	TO-204AA	N	75	5.5	400	1
2N6762	542	TO-204AA	N	75	4.5	500	1.5
2N6764	543	TO-204AE	N	150	38	100	0.055
2N6766	543	TO-204AE	N	150	30	200	0.085
2N6768	543	TO-204AA	N	150	14	400	0.3
2N6770	543	TO-204AA	N	150	12	500	0.4
2N6782	556	TO-205AF	N	15	3.5	100	0.6
2N6784	556	TO-205AF	N	15	2.25	200	1.5
2N6788	555	TO-205AF	N	20	6	100	0.3
2N6790	555	TO-205AF	N	20	3.5	200	0.8
2N6792	555	TO-205AF	N	20	2	400	1.8
2N6794	555	TO-205AF	N	20	1.5	500	3
2N6796	557	TO-205AF	N	25	8	100	0.18
2N6798	557	TO-205AF	N	25	5.5	100	0.4
2N6800	557	TO-205AF	N	25	3	400	1
2N6802	557	TO-205AF	N	25	2.5	500	1.5
P-Channel Types	**MIL-S-19500/**	**Package**	**Channel**	**P_T (W)**	**I_D (A)**	**BV_{DSS} (V)**	**r_{DS} (on) Ω**
2N6895	565	TO-205AF	P	8.33	-1.5	-100	3.65
2N6896	565	TO-204AA	P	60	-6	-100	0.6
2N6897	565	TO-204AA	P	100	-12	-100	0.3
2N6898	565	TO-204AA	P	150	-25	-100	0.2
2N6849	564	TO-205AF	P	25	-6.5	-100	0.3
2N6851	564	TO-205AF	P	25	-4.0	-200	0.8
N-Channel Logic-Level Types	**MIL-S-19500/**	**Package**	**Channel**	**P_T (W)**	**I_D (A)**	**BV_{DSS} (V)**	**r_{DS} (on) Ω**
2N6901	566	TO-205AF	N	8.33	1.5	100	1.4
2N6902	566	TO-204AA	N	75	12	100	0.2
2N6903	566	TO-205AF	N	8.33	1.5	200	3.65
2N6904	566	TO-204AA	N	75	8	200	0.65